题目

摘要：经验模态分解（(Empirical Mode Decomposition,EMD）是一种对非平稳信号进行处理分析的常用工具，目前在许多科学与工程领域得到了广泛的应用。近年来有大量的学者尝试将该技术应用到时间序列的建模与预测中。股票指数数据作为一种典型的时间序列历来受到广大学者的青睐，所以有学者开始将EMD运用到股票指数的预测研究中。然而，在于EMD结合的预测模型中普遍存在两个问题。首先，因为EMD的核心是对信号进行分解，所以在对分解信号进行组合预测时，存在模型复杂度高、运算效率低等问题。针对该问题，本文改进了常见的基于EMD和ANN的组合模型，从原来单纯的叠加模型EMD-ANN改进为单一预测模型S-EMD-ANN。结果表明，改进的模型在预测的精度上有所提高，在模型运算效率上有显著提高。其次，因为EMD算法的固有特性，在对时间序列进行分解时会引入一定的“前瞻性”偏差，很不幸的是，大多数学者忽略掉了该偏差，使得预测结果表现的相当“漂亮”。针对该问题，本文依据一些学者的思想改进了基于EMD和ANN的自适应预测模型。实证实验表明，以往剔除“前瞻性”偏差的自适应混合模型AEMD-ANN和S-AEMD-ANN的预测结果并不优于单独的ANN模型的预测结果。文中提出的改进模型S-AEMD-ANNa的预测结果明显优于以往的自适应模型预测结果，而且也优于单独的ANN模型预测结果。

关键词：经验模态分解；股指预测；前瞻性偏差；自适应预测

Title

**Abstract：**Empirical Mode Decomposition (EMD) is a common tool for processing and analyzing non-stationary signals. It is currently widely used in many scientific and engineering fields. In recent years, a large number of scholars have tried to apply this technology to modeling and forecasting of time series. Stock index data as a typical time series has always been favored by a large number of scholars, so some scholars have begun to apply EMD to the prediction research of stock indexes. However, there are two problems in the prediction model combined with EMD. First, because the core of EMD is to decompose signals, when combining predictions of decomposed signals, there are problems such as high model complexity and low computational efficiency. To solve this problem, this paper improves the common combination model based on EMD and ANN, from the original superimposed model EMD-ANN to a single prediction model S-EMD-ANN. The results show that the improved model has improved the accuracy of prediction, and has significantly improved the model operation efficiency. Secondly, because of the inherent characteristics of the EMD algorithm, a Look-ahead bias will be introduced when decomposing the time series. Unfortunately, most scholars ignore this bias, making the prediction results behave quite "pretty". To solve this problem, this paper improves the adaptive prediction model based on EMD and ANN based on the ideas of some scholars. Empirical experiments show that the prediction results of the adaptive hybrid models AEMD-ANN and S-AEMD-ANN, which exclude the Look-ahead bias, are not better than those of the separate ANN model. The prediction results of the improved model S-AEMD-ANNa proposed in this paper are significantly better than those of the previous adaptive model, and also better than the prediction results of the separate ANN model.

**Keywords:** EMD; Stock index forecast; Look-ahead bias; Adaptive forecast